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Japanese Published Unexamined Patent Application (A) No. 10-217090, published August 18, 1998; Application Filing No. 9-25176, filed February 7, 1997; Inventor(s): Taiki Hirayama; Assignee: Daihatsu Engineering, Inc.; Japanese Title: Paper Lapping Devices

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PAPER LAPPING DEVICES

CLAIM(S)

1) A paper lapping device, wherein multiple lap shoes are positioned on the outer circumferential surface of an axially-shaped work, and while rotating the work, the lapping paper is pressed against the outer circumferential surface of the work by each lap shoe to polish the outer circumferential surface of the work; said paper lapping device being characterized in that a contact section where each lap shoe contacts with the lapping paper is positioned symmetrically to the axial line of the work.

2) A paper lapping device, as cited in Claim 1, wherein the widths of contact sections of both lap shoes where the contact sections contact with the lapping paper are made to differ.

3) A paper lapping device, as cited in Claim 1, wherein the widths of said contact sections of both lap shoes where the contact sections contact with the lapping paper are displaced in position in the axial direction.

DETAILED DESCRIPTION OF THE INVENTION

(0001)

(Field of Industrial Application)

In the prior art final finishing process of a crank pin section of a crankshaft, which is one of engine components, a lapping process is applied to an outer circumferential surface of a work by paper lapping (Japanese Published Unexamined Patent Applications 05-169361, 07-052005, 07-075953).

(0003)

In this paper lapping process, as shown in Fig. 3 (a) and (b), the lapping paper in tape shape (3) is pressed against an outer circumferential surface 1a of the work by a pair of lap shoes positioned to interpose the work 1, and in this condition, the work 1 is rotated by a driving device not shown in the figure to perform the lapping. The lapping paper 3 is pulled up after having been made to pass underneath other lap shoe 2, through the gap between the work 1 and both lap shoes 2, and underneath the other lap shoe 2 successively in this order, and its both ends are connected to a pay out roller and a winding roller (not shown in the figure), respectively. The lap shoes 2 are attached to the lower end of arm 5, respectively, so, by closing the arm 5 in the arrow direction, both lap shoes 2 are pressed against the

outer circumferential surface of the work 1. As mentioned above, during the lapping process, lapping paper 3 is pressed against the work's circumferential surface by the lap shoes 2 and the work 1 is rotated/driven on the center of axial line X, while at the same time, the work 1 is driven to reciprocate back and forth in the axial direction (oscillation) by the prescribed strokes, so that the surface of work 1 to be polished is uniformly polished over the entire surface.

(0004)

With the prior art device of this type, both lap shoes 2 share the same shape having the same width (L) in the axial direction, and are positioned to oppose to each other.

(0005)

(Problems with the Prior Art to Be Addressed)

With the prior art device, as shown in Fig. 4, the lapping paper 3 strongly hits the surface of work 1 at both ends of the stroke S in oscillation, so too much grinding occurs to this section. Therefore, both ends of work 1 are recessed (shown by a dotted line) from the desired finished surface, creating a non-straight surface (In the figure, the depth of the recess 6 is exaggerated.).

(0006)

The present invention attempts to present a paper lapping device that prevents a local excessive grinding and can improve the finished surface to be straight.

(0007)

(Means to Solve the Problems)

To solve the aforementioned problems, in the paper lapping device of the present invention, multiple lap shoes are positioned around the outer circumferential surface of the axially-shaped work, and while rotating the work, the lapping paper is pressed against the outer circumferential surface of the work by each lap shoe to polish the outer circumferential surface of the work. A contact section of each lap shoe where the contact section contacts with the lapping paper is positioned symmetrically to the axial line of the work.

(0008)

More specifically, the width of the contact section in the axial direction where the contact section of each lap shoe contacts with the lapping paper is made to differ.

(0009)

Also, the width of the contact section of each lap shoe in the axial direction where the contact section contacts with the lapping paper is made equal and said contact section is displaced along the axial direction.

(0010)

(Embodiment Example)

The embodiment example of the present invention is explained below with reference to the figures. The device of the present invention shares almost the same structure with that of the prior art device, shown in Fig. 3 (a) and (b), except the lap shoe, so the explanation on the common components are omitted and only the difference is explained.

(0011)

As shown in Fig. 1, in the device of the present invention, of the pair of lap shoes (2) positioned on both sides of the axially shaped work 1 (e.g., the crank pin section of the crankshaft), the contact section (2a) to contact with the lapping paper 3 is positioned non-symmetrically to the axial line (X) of the work 1. Fig. 1 shows the case wherein the widths (L1 and L2) of the contact sections 2a of 2 lap shoes in the axial direction differ (L1 > L2).

(0012)

Because of the aforementioned structure, even when the work 1 is oscillated in the axial direction, the polishing regions for both lap shoes (2) never overlap, so one of the regions is polished by only one of the lapping papers 3. Therefore, the hitting at the stroke end section in oscillation can be made weaker. As a result, the local excessive grinding of this section can be prevented and it becomes possible to improve the straight level of the finished surface.

(0013)

In addition, it will be sufficient if the contact section 2a is positioned non-symmetrically to the axial line X and is not limited to the one wherein the width L1 and L2 in the axial direction differ, as shown in Fig. 1. It will produce the same effect if the widths of both contact sections 2a in the axial direction are made equal and their positions are displaced from each other in the axial direction, as shown in Fig. 2.

(0014)

In the above explanation, as an example of axially-shaped work 1, the crank pin section of the crankshaft was used, but the present invention is applicable not only to this example but also general works having an axial shape. The “axially shaped work” here refers to anything whose sectional

shape of the outer circumference forms a round shape, including the one which is hollow inside and the one which is solid inside.

(0015)

The present invention is applicable as long as the lap shoe 2 is positioned at multiple places on the outer circumferential surface 1a of the work 1. It is not limited to the aforementioned example wherein the lap shoe 2 is positioned at 2 places on both sides of the work 1, but it is applicable as well if the lap shoe is positioned at 3 places on the outer circumferential surface 1a.

(0016)

(Advantage of the Invention)

According to the present invention, when the axially shape work is subjected to paper lapping, local excessive grinding at the stroke end section in oscillation can be prevented and the straight level of the finished surface can be improved.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows a sectional view of the paper lapping device in the axial direction as one embodiment example of the present invention.

Fig. 2 shows a sectional view of the paper lapping device in the axial direction as another embodiment example of the present invention.

Fig. 3 (a) shows a sectional view of the prior art device in the axial direction and (b) its sectional view in the radial direction.

1. work

1a. outer circumferential surface of the work

2. lap shoe

2a. contact section

3. lapping paper

X. axial line

Translations
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